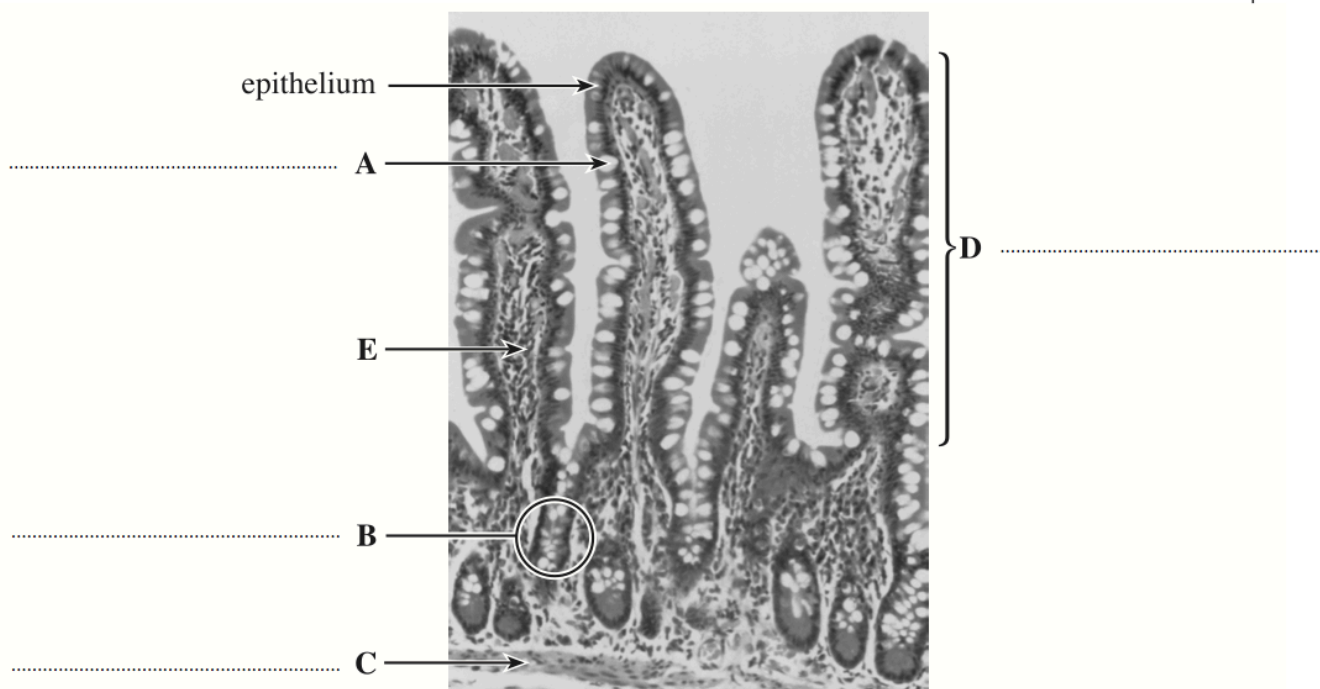


Extra Modes of Nutrition Questions from the Old A level Syllabus Paper 5

1.

4. (a) The light micrograph shows a section through the wall of the intestine.



Biophoto Associates/Science Photo Library

- (i) Identify **A** to **D** on the micrograph. [4]
- (ii) State **two** types of vessel found in the region labelled **E**. [2]
-
- (b) Describe how **two** features of the cells of the epithelium aid in the absorption of the products of digestion. [4]

Feature 1

Description 1

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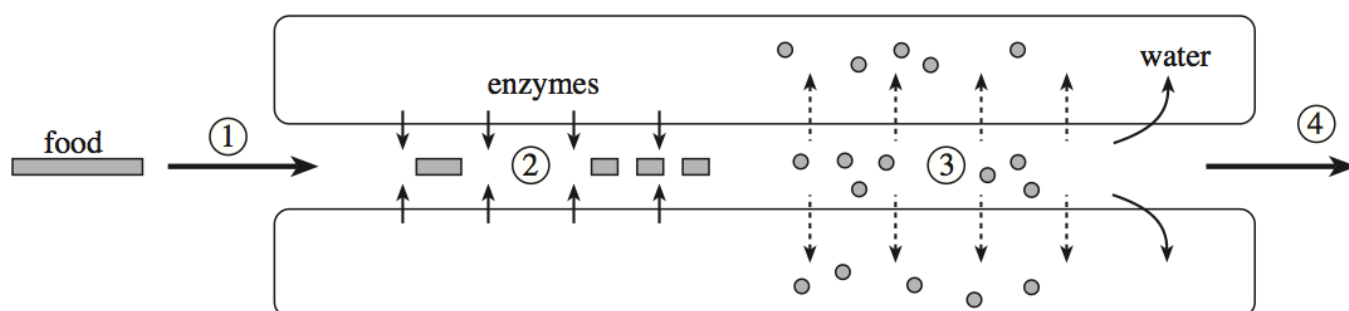
Feature 2

Description 2

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2.

2. The diagram shows the processes that would take place in a simple tube gut.



(a) (i) Name the processes numbered 1-4. [2]

1.
2.
3.
4.

(ii) Define the process numbered 2. [1]

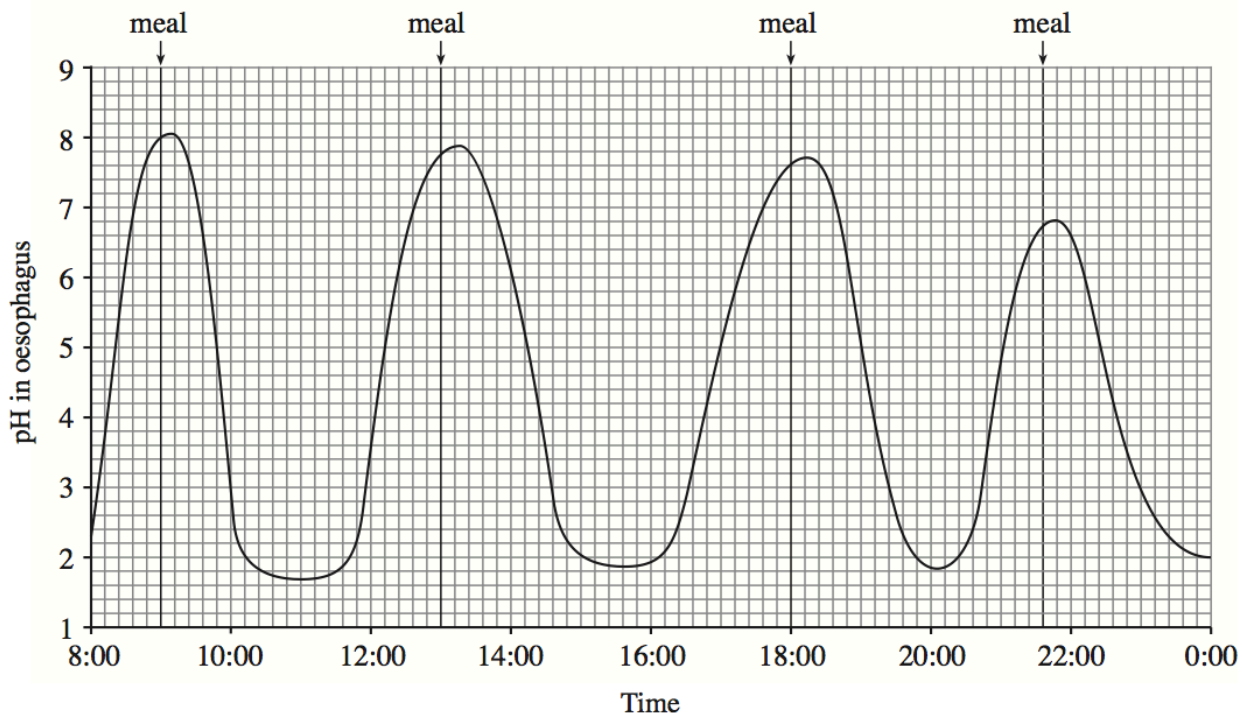
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(b) In mammals the gut is modified to form specialised organs with specific roles. Complete the following table to show some of the enzymes secreted by a mammalian gut, their action and the associated organs. [4]

Enzyme	Substrate	Products	Site of secretion
pepsin		peptides	
peptidases	peptides		
	lipids	fatty acids and glycerol	
		maltose	salivary gland

- (b) Some people continually overproduce acid in the stomach. During acid reflux, the acidic contents of the stomach move up into the oesophagus, causing irritation and damage to the cells lining the oesophagus. Acid reflux is one cause of 'heartburn'. A pH probe was used to discover whether a patient's 'heartburn' was caused by acid reflux. This probe monitored the pH in the oesophagus from 8am to midnight. The results are shown below.



- (i) Suggest how the stomach contents are normally prevented from moving up into the oesophagus. [1]
-
- (ii) State **three** functions of the acid secreted in the stomach. [3]
1.
2.
3.
- (iii) Why are cells lining the stomach not affected by acid in the same way as the cells lining the oesophagus? [1]
-
- (iv) Suggest an explanation for the pH values observed in the **oesophagus** up to an hour **after** a meal is eaten. [2]
-
-
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[Total 12 marks]

3.

(a) Describe the digestion of carbohydrate in the alimentary canal.

[5]

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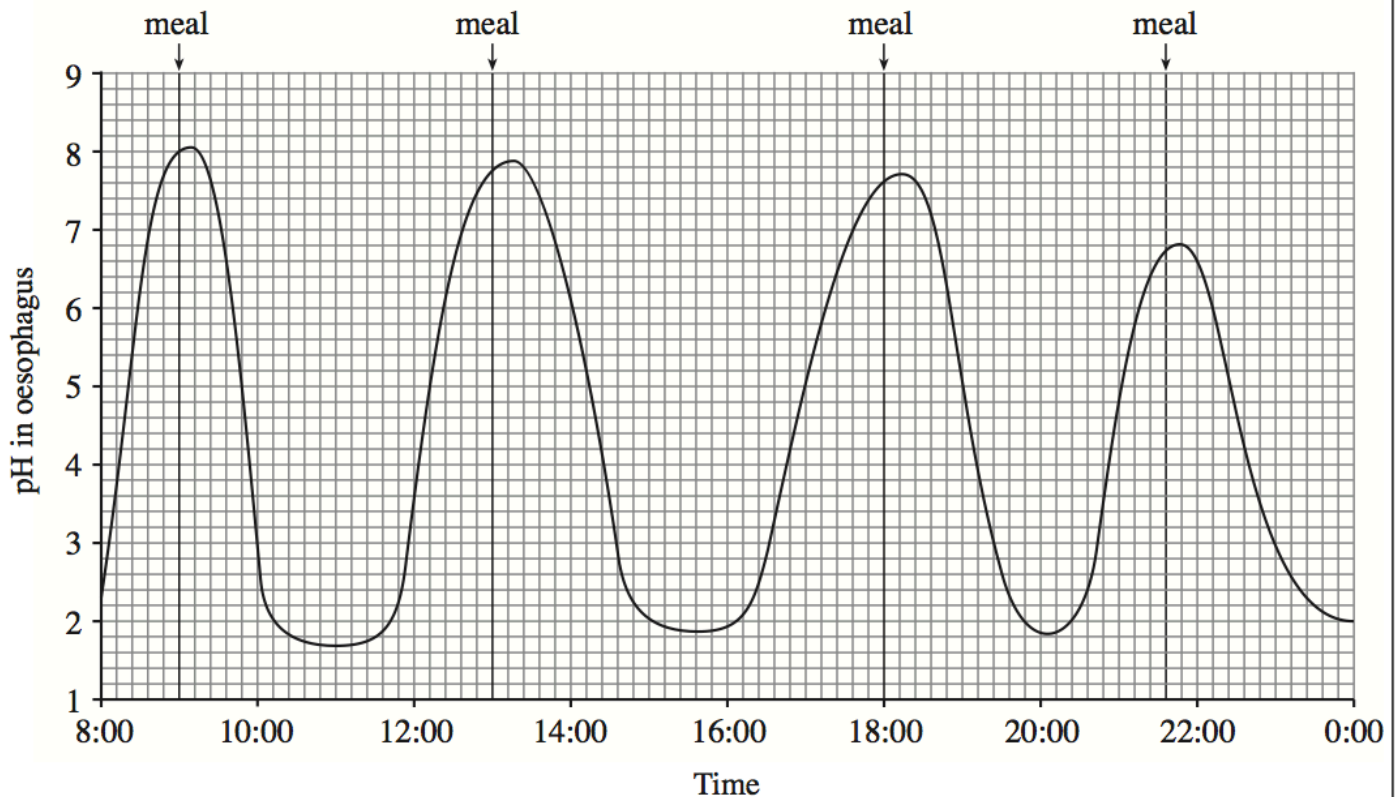
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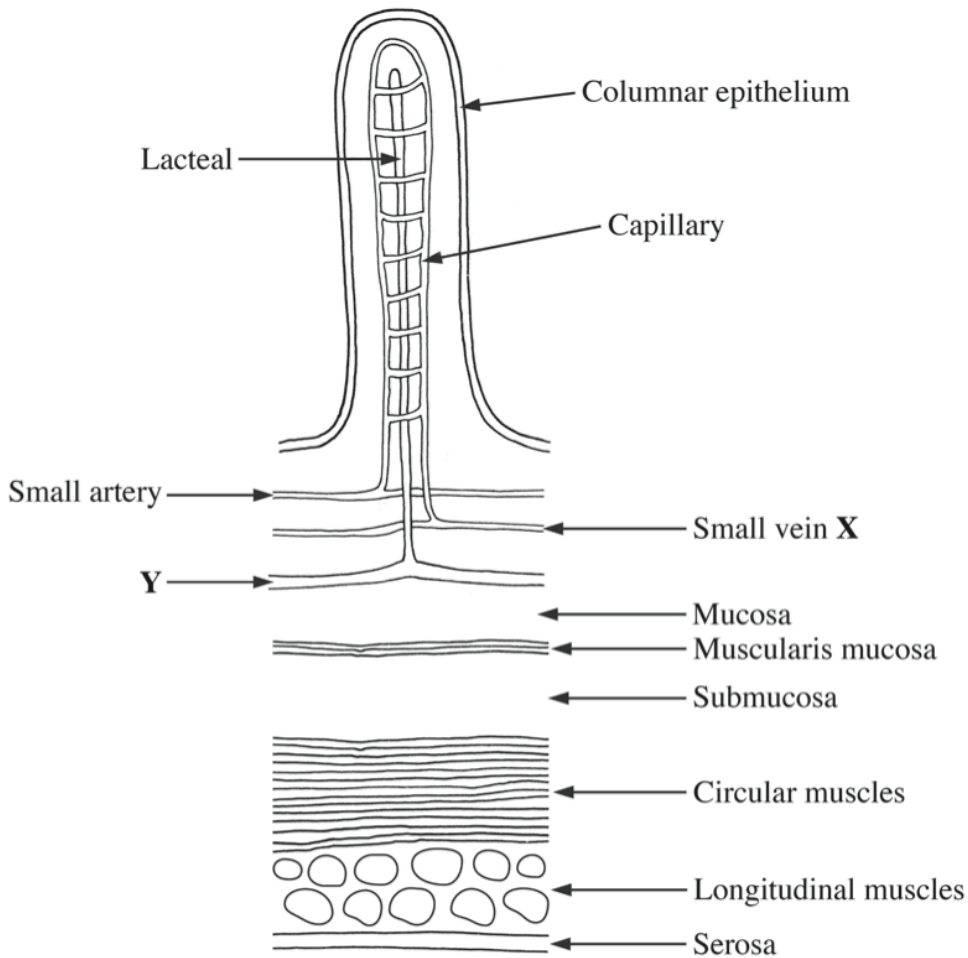
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[Total 12 marks]

4.

The drawing represents a section of the wall of the small intestine.



(a) What is the role of the following structures in the function of the small intestine?

(i) Circular and longitudinal muscles. [1]

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(ii) Goblet cells. [1]

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(iii) Lacteals. [1]

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(b) (i) Which vessel does the blood in vein **X** enter? [1]

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(ii) What is the name of the fluid in structure **Y**? [1]

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(c) In the duodenum there are glands in the submucosa called Brunners glands. What do these glands secrete and what is the function of the secretion? [2]

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(d) Coeliac disease in humans is caused by chemicals in wheat, barley and rye leading to a loss of villus height and a breakdown of microvilli.

(i) Explain why people with coeliac disease sometimes suffer from deficiency diseases. [2]

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(ii) How do you account for the reduced efficiency of digestive enzymes such as those involved with the final breakdown of disaccharides and dipeptides in people with coeliac disease? [2]

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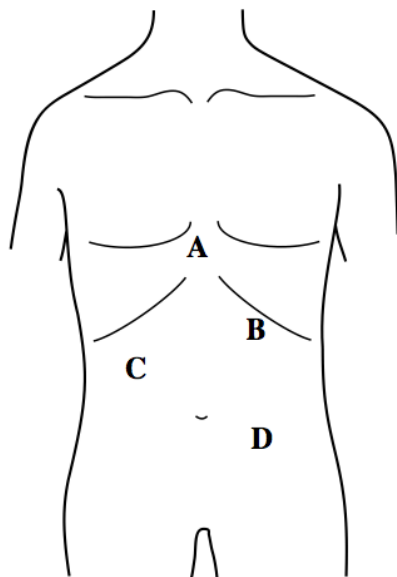
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(Total 11 marks)

5.

In 1833, Dr. William Beaumont conducted experiments on a man who, having recovered from a gunshot wound, was left with a small hole in his body leading to the interior of his stomach.

- (a) Draw a circle round the letter that shows the most probable position of the hole. [1]



- (b) Dr. Beaumont described one of his experiments as follows: “Juice was extracted from the stomach and placed in a small tube. A solid piece of boiled, recently salted beef was added. The tube was then corked and kept under controlled conditions. A similar piece of beef was suspended on a string into the man’s stomach”.

- (i) Suggest one condition which he might have controlled in the tube. [1]

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- (ii) State the importance of using “boiled, recently salted beef”. [1]

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- (c) After two hours, Dr. Beaumont recorded the following results:

“Beef in tube - the cellular texture seems to be entirely destroyed, leaving the muscle fibres loose and unconnected, floating about in fine, small shreds, very tender and soft”.

“Beef in stomach - I drew out the string, but the meat was completely digested and gone.”

Use your knowledge of the process of digestion to account for the difference between the changes in the tube and in the stomach. [3]

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(d) After digestion in the stomach, the contents pass into the duodenum.

(i) Name [2]

1. a protease secreted into the duodenum,

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2. the gland which secretes it.

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(ii) Explain why proteases are usually secreted in an inactive form. [2]

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(iii) Some of the absorbed end products of digested beef may undergo deamination. Explain the nature and significance of this process. [2]

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[Total 12 marks]

6.

Physical or mechanical digestion is an important aspect of digestion as food passes through the alimentary canal.

- (a) (i) State the **two** main areas of the alimentary canal where mechanical breakdown occurs. [1]

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- (ii) Why is mechanical breakdown important? [1]

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- (b) Bile is released into the small intestine where it is mixed with the contents. Bile contains bile salts.

In an experiment, lipase was added to a mixture of water and olive oil and the pH of the mixture was monitored at regular intervals. The experiment was repeated, under the same conditions, but with bile salts. The results are shown in the table below.

<i>Time / min</i>	<i>pH</i>	
	<i>Lipase</i>	<i>Lipase and bile salts</i>
1	8.0	8.0
2	7.8	7.4
3	7.4	6.8
4	7.1	6.3
5	6.8	5.9
6	6.6	5.9

- (i) Explain why lipase causes a drop in pH. [1]

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- (ii) Explain the more rapid drop in pH when bile salts are present. [2]

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- (iii) State **one other** function of bile in the small intestine. [1]

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- (c) The digested products of carbohydrates, lipids and proteins are absorbed into the villi of the ileum.

Outline how **each** of these products is transferred into the **bloodstream**. [5]

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- (d) Obesity is a major health concern, in the western world including Wales.

Explain how an excess of **all** the absorbed digested products can lead to an increase in body mass. [2]

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(Total 13 marks)

7.

An investigation was carried out into the digestion of starch.

- 5 cm³ of 1% starch suspension was placed in each of four tubes.
- The same mass of each tissue as indicated in the table, was ground up separately in 10 cm³ of deionised water.
- 2 cm³ of this suspension was added to each of the four tubes.
- A control tube was set up.
- The tubes were incubated at 37°C for 15 minutes and the contents of each tube were tested for the presence of sugars.

<i>Tube</i>	<i>Tissue from which suspension was prepared</i>	<i>Test for presence of sugar</i>
1	Salivary gland	Positive
2	Stomach wall	Negative
3	Duodenum wall	Negative
4	Pancreas	Positive

(a) (i) Name the enzyme which brings about the digestion of starch. [1]

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(ii) What effect does this enzyme have on starch? [1]

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(b) (i) Explain why there is no starch digestion in tube 2. [1]

.....

(ii) Compare the results for tubes 3 and 4 and explain why they are different. [1]

.....

(c) Describe in detail how you would set up a control experiment. [1]

.....

[Total 5 marks]

8.

- (a) Complete the following table to indicate where, in the alimentary canal, chemical digestion of each class of food **begins**. [3]

<i>Food</i>	<i>Where digestion begins</i>
Carbohydrate	
Protein	
Fat	

- (b) Explain the difference in action of exopeptidases and endopeptidases. [2]

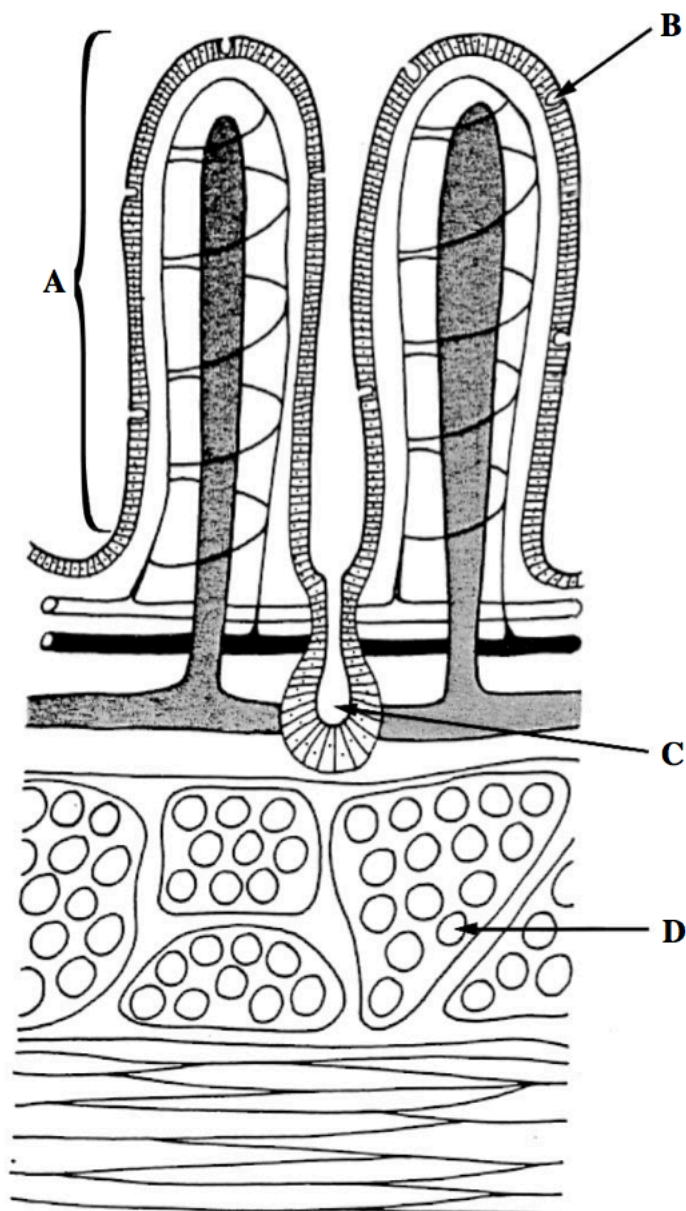
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(c) The diagram represents a longitudinal section of the wall of the ileum.



(i) Name the structures labelled A to D.

[4]

- A
- B
- C
- D

(ii) Indicate the following, by labelling on the diagram with the appropriate letter. [3]

L	Where the final stages of digestion of disaccharides take place.
M	The vessel that glucose enters after absorption.
N	The vessel that fatty acids and glycerol enter after absorption.

(d) Explain why fibre should be included in the diet. [2]

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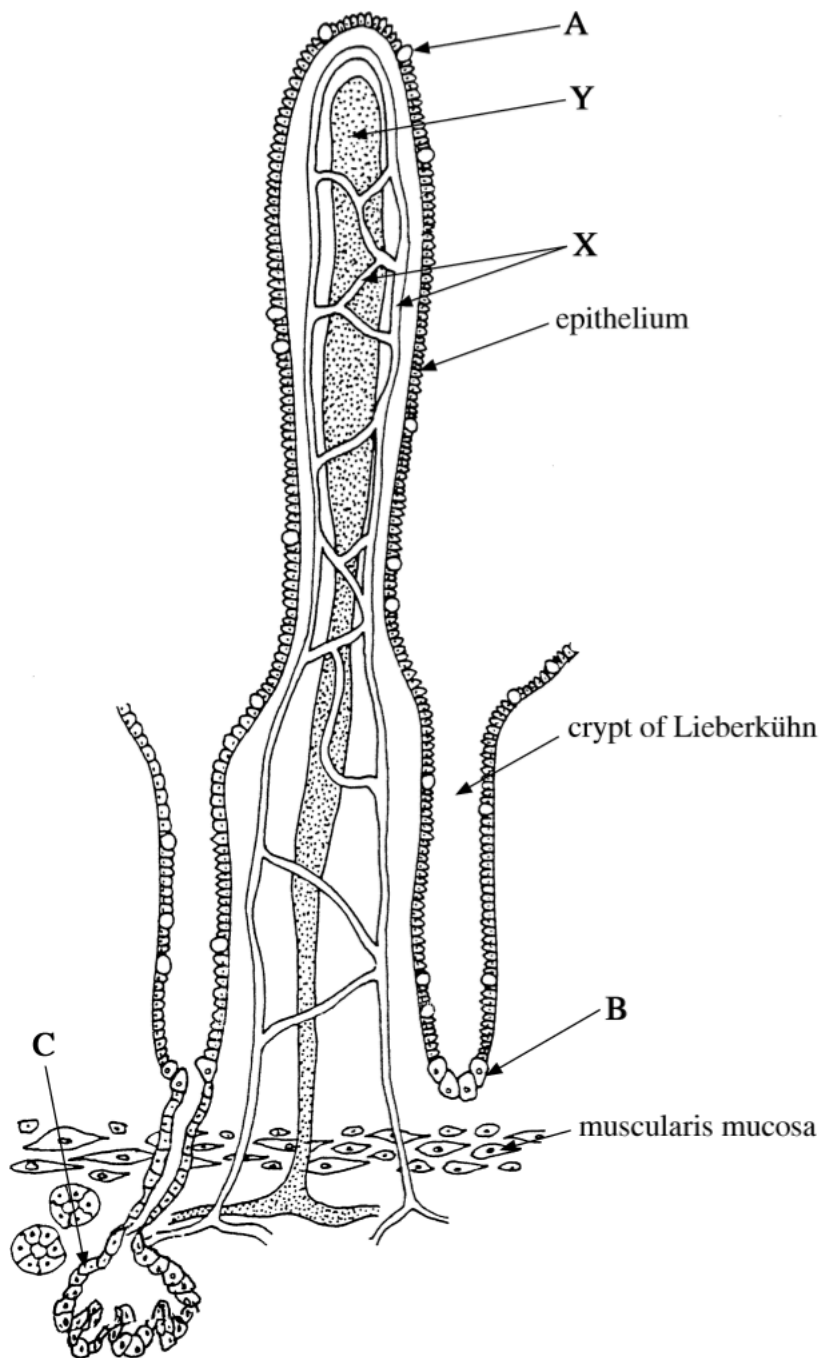
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(Total 14 marks)

9.

The diagram shows a villus from the small intestine.



- (a) (i) Give the names of structures **A**, **B** and **C** and complete the table. [4]

<i>Structure</i>	<i>Name</i>	<i>Secretion</i>
A		mucus
B		
C		alkaline mucus

- (ii) Give **two** functions of the mucus secretions. [2]

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- (b) Apart from its length, state **two** other ways in which the surface area of the small intestine is increased. [2]

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- (c) Identify structures **X** and **Y** and state what is absorbed in each case. [4]

X

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.....

Y

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(Total 12 marks)

10.

The table shows the names of some digestive enzymes and their source.

Complete the columns labelled 'Site of action' and 'Action' in the table, indicating (A) the substance on which each enzyme acts and (B) the product that is formed. [8]

<i>Enzyme</i>	<i>Source</i>	<i>Site of Action</i>	<div> <div>A</div> <div>Action</div> <div>→</div> <div>B</div> </div>
Salivary amylase	Salivary glands		→
Pepsin	Stomach		→
Trypsin	Pancreas		→
Lipase	Pancreas		→

(Total 8 marks)

Essays

1.

- (b) Digestion is completed in the small intestine. Give an account of the uptake of the products of digestion. Describe what happens to each product once it has entered the body. [10]

2.

- (a) Describe the digestion of protein and the fate of the products of protein digestion. [10]

3.

Describe how and where the human gut digests and absorbs

- (a) Fats,

[5]

- (b) Proteins.

[5]